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other country to appoint agents in its States. This want of competition was the reason why assurance was for a long time in Austria at a very low ebb; only lately it has begun to extend from Trieste, where some well organized Insurance Offices exist. Up till recently it was principally fire insurance, on which the different Governments practised a very restraining oppression; but lately they have begun also to extend it to life insurances. Thus, for example, the Hanoverian Government has lately demanded from all Companies which do business in that country by means of agents, that they should give in, besides the tables of premiums, also the mortality table according to which the premiums are computed—that they should also specify the net premiums, the marginal additions to the net premiums, and the reserve value of the policies for the different ages. The Government of Wirtemberg demands likewise the production of the mortality table, and stipulates moreover that each foreign Life Assurance Office should appoint a chief agent as plenipotentiary-general for the whole kingdom—that it should deposit every year with the Government statements of the new insurances effected in Wirtemberg, and of the amount of all the assurances there—that it submit, also, in questions of dispute, to the decision of the tribunals of Wirtemberg, and according to circumstances give bail to the Government for the punctual execution of its obligations. Thus the claims of different Governments are often very different; and many an establishment which has submitted to the claims of one Government can therefore easily be excluded from another country, because prescriptions are made in it which do not agree with those claims. In the great subdivision of Germany these are difficulties which throw great obstacles in the way of a beneficial development of assurance business. Every established Company, after having existed some time, would hesitate to make essential alterations in its statutes, because it would be obliged to obtain the consent of all those Governments to it in the countries in which it effects business, which is frequently subjected to great difficulties. As for fire insurance, the forms even of the proposals of insurance and of the policies are subject to the control of Government, and different Governments have laid down different rules for them; so that one and the same Company must use different formulæ at the same time, according as it effects insurances in this or that country. If your country shows the injury and defects which arise from the want of control as regards assurance, you will find soon in Germany the inconveniences which result from applying too many and too different regulations.

REVIEWS OF NEW WORKS.

On a Theory of the Conjugate Relations of two rational Integral Functions, comprising an application to the Theory of Sturm's Functions, and that of the greatest Algebraical Common Measure. By J. J. Sylvester, Esq., M.A., F.R.S., Barrister-at-Law.

This treatise or memoir has nothing in connection with the subjects usually discussed in the *Assurance Magazine.* We are induced nevertheless to give the following analysis of its contents, extracted from the "Proceedings of the Royal Society," partly on account of its very original and remarkable character, and partly on the score of our knowledge that several of our readers are much interested in the progress of Mr. Sylvester's most curious and erudite investigations.

"The memoir consists of four sections. In the first section, the theory of the residues obtained by applying the process of the common measure to two algebraical functions is discussed. It is shown that a certain superfluous or *allotrious* factor enters into each, the value of which, in terms of the leading coefficients of the residues in their simplified form, is determined; and the simplified residues themselves are subsequently obtained from the given functions by a direct method.

"In the case where the two functions are of the same degree (m) in x, m functions of the degree $m-1$ in x are formed, which, being identical with those employed in the process which goes by the name of Bezout's abridged method, the author terms the Bezoutics, or Bezoutic primaries. By linear elimination performed between these, a second system of functions, whose degrees in x extend from $m-1$ to 0, are formed, which he terms the Bezoutic secondaries; these Bezoutic secondaries are proved to be identical with the simplified residues. A similar theory is shown to be applicable in the general case of the functions being of unlike degrees. Other modes of obtaining the simplified residues by a direct method are also given. The coefficients of the primary system of Bezoutics form a square symmetrical about one axis, to which (as to every symmetrical matrix) a certain homogeneous quadratic function of (m) variables is appurtenant. This quadratic function is termed the Bezoutiant, the properties of which are discussed in the fourth section.

"Every residue is what may be termed a syzygetic function or conjunctive of the two given functions; these being respectively multiplied by certain appropriate rational integral functions, their sum may be made to represent a residue. These multipliers are termed the syzygetic multipliers; and they form two series, one corresponding to the successive numerators, the other to the successive denominators of the convergents to the algebraical continued fraction which expresses the ratio of the two given functions. The residues are obviously a particular class of the conjunctives that can be formed from the given functions; every conjunctive has the property of vanishing when the two functions to which it is appurtenant vanish simultaneously; and in general, for any given degree in x, an infinite number of such conjunctives can be formed.

"In the second section, the author commences with obtaining in terms of the roots and factors of the two given functions a variety of forms, all containing *arbitrary* forms of function in their several terms, and representing a conjunctive of any degree not exceeding the sum of the degrees of the two given functions in its most general form. The author then reverts to the Bezoutic system of the first section, and obtains the general solution for the conjunctive of any given degree in x in terms of the *coefficients* of the given function; by aid of this general solution he demonstrates that the residues obtained by the common measure process (divested of their allotrious factors) are the conjunctives of the lowest *weight* in the roots of the given functions for their several degrees; and obtains the value of this weight. He then demonstrates that certain rational but fractional forms ascribed to the arbitrary functions in the general expressions for a conjunctive in terms of the roots, will make these expressions integral and of the minimum weight; they will all be consequently identical (save as to a numerical factor) with one another, and with the simplified residues. The formulæ thus obtained for the simplified residues deserve particular attention on their own account, being double sums of terms, any single series of which is made up of fractions whose denominators are the products of the differences between a certain number of the roots of each one of the functions and a certain other number of the same combined in every possible manner, thus containing a vast extension of the ordinary theory of partial fractions. The author subsequently determines, under a similar form, the value of each of the multipliers which connects the given functions syzygetically with the simplified residues, and establishes a general theorem of reciprocity, by aid of certain general properties of continued fractions, between the series of residues and either series of syzygetic multipliers.

"The third section is divided into two parts. The first part is devoted to a determination of the values of the preceding formulæ in the case to which Sturm's theorem refers, where one of the given functions is the first differential derivative of the other; when this is the case the roots and factors of the second function are functions of those of the first, and it will be found that one of the polymorphic representations for the residue of any given degree will consist of terms, each of which is convertible into an integral function of the roots and factors of the given primitive function: in this way are obtained the author's well known formulæ for Sturm's auxiliary functions. In like manner, the multiplier which affects the derivative function in the syzygy between the primitive, the derivative and any simplified residue, may also be expressed immediately as a sum of integral functions of the roots and factors of the primitive, complementary in some sort to the formulæ for the residues. The formula for the remaining syzygetic multiplier (that which attaches to the primitive itself) cannot be obtained directly by a similar method, but it is deduced by aid of the syzygetic equation itself, all the other of the five terms of which are known, or have been previously determined. The process of obtaining this last-named multiplier is one of great peculiarity and interest, and results in a form far more complex than that for the residues or for the other syzygetic multiplier.

"In the second part of the third section are contained some curious and valuable expressions for the residues and multipliers, communicated to the author by M. Hermite; and an instantaneous demonstration is given of the properties of the author's formulæ for Sturm's auxiliary functions in determining the real roots of an equation by a method quite irrespective of the theory of the common measure, and depending upon a certain extremely simple but unobserved law of quadratic forms, which he terms the law of *inertia*. In place of these formulæ it is shown that others greatly more general, and possessing the same properties as regards the determination of the real roots, may be substituted; the known formulæ are, however, the most simple that can be employed. The author then proceeds to inquire as to the nature of the indications afforded by the signs of a series of successive simplified residues, taken between any two functions independent of one another, instead of standing in the relation of primitive and derivative, as in Sturm's theorem; this leads to the theory of interpositions, of which it is shown that the Sturmian theorem may be treated (not so much as a particular case) as an easy corollary. In this part the author obtains an entirely new rule for determining, in an infinite variety of ways, a superior and inferior limit to the real roots of any algebraical equation, whether numerical or literal.

"The fourth section is also divided into two parts. In the first part, the index of interposition for two functions of the same degree is shown to be determinable by means of the quadratic form, previously termed the Bezoutiant; and as a corollary, it follows that the number of real roots of an equation of the degree m depends in a direct manner on the number of positive roots in another equation of the degree $m-1$, all of whose roots are real, and the coefficients of which are quadratic combinations of the coefficients of the given equation.

"In the second part of this section, the Bezoutiant is considered under a purely morphological point of view. It is shown to be a combinantive invariant of the two given functions (each treated as homogeneous functions of two variables), remaining unaltered when any linear combination of the two given functions is substituted for the functions themselves, and also when any linear substitutions are impressed upon the variables of the given functions, provided that certain corresponding substitutions are impressed upon the variables of the Bezoutiant. The family of forms to which the Bezoutiant belongs is ascertained, and a method given for finding the constituent forms of this family (one less in number than the number of odd integers not exceeding in magnitude the degree of either of the given functions which, throughout this section, are supposed to be of equal dimensions in x), of which all other forms of the family will be numerico-linear functions. The numerical coefficients connecting the Bezoutiant with this constituent group are calculated for the cases corresponding to any index from 1 to 6 inclusive. Finally, the author remarks upon the different directions in which the subject matter of the ideas involved in Sturm's justly celebrated theorem admits of being expanded, and of which the most promising is, in his opinion, that which leads through the theory of interpositions. Several of the theorems in this memoir have been previously published by the author, but they are here given along with a great deal of new matter in a connected form, and with the demonstrations annexed, for the first time."

A Treatise upon the Law of Life Assurance upon the constitution of Assurance Companies, the construction of their Deeds of Settlement, the Sale of Reversionary Interests, and Equitable Liens arising in connection with Life Policies: with an Appendix of Precedents for the Assignment of Policies by way of sale, mortgage, and settlement; Notes of Cases; Statutes; and an Index of Private Acts obtained by Insurance Companies. By CHARLES JOHN BUNYON, M.A., of the Inner Temple, Esq., Barrister-at-Law. London: Wildy & Sons, Lincoln's Inn Archway. Dublin: Hodges & Smith, Grafton Street. 1854.

CONSIDERING the extent to which the practice of life assurance has been carried in this country, it is surprising how little has been written upon the law of it; and the more so when the great number of cases before the courts, on all sorts of points connected with the practice, is taken into account. There can be no doubt that the want of a treatise which should throw some light upon the infinite variety of questions constantly presenting themselves to the harassed minds of the actuaries and managers of Life Assurance Companies has been extensively felt, and we are much mistaken if these gentlemen will not look upon Mr. Bunyon's work as a most acceptable